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(54) Stair lift installation.

(57) The invention relates to a stair lift installation provided with guide means running substantially parallel to a stairway, a frame displaceable along the guide means, a load carrier (e.g. a chair) suspended pivotally on the frame and means connected to the frame for driving thereof. The installation further has levelling means connecting the frame to the load carrier for holding the load carrier in a fixed position relative to the horizontal. The levelling means are formed by a control member carrying information about the position and connected to the drive means and a follower member to be controlled thereby. The control member and the follower member are movable relative to each other.

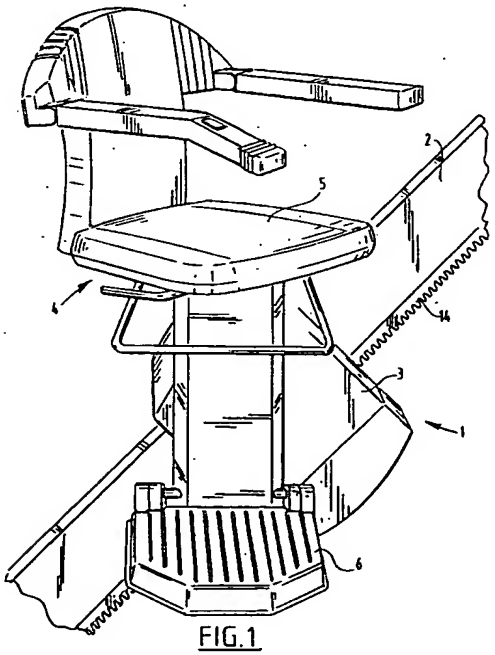

FIG.1

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The present invention relates to a stair lift installation provided with guide means running substantially parallel to a stairway, a frame displaceable along the guide means, a load carrier suspended pivotally on the frame, means connected to the frame for driving thereof and levelling means for holding the load carrier in a substantially fixed position relative to the horizontal.

Such installations are used on large scale for transporting persons between different floors in buildings in which no shaft lift installation is or can be incorporated. In particular, stair lift installations are often fitted later in residential accommodation when one of the occupants has difficulty walking or becomes disabled.

A problem that arises in the case of stair lift installations when the stairway along which the installation is arranged has a bend is that the inclination of the guide means in the bend differs from that outside the bend, whereby special steps must be taken to maintain a determined desired position of the load carrier relative to the horizontal.

Stair lift installations are known wherein the guide means are formed by an I-profile and the slope variations are absorbed by varying the height of the web of the I-profile. This solution has the drawback that the use of a standard guide profile for this purpose is excluded, so that the cost of the installation is considerable. Furthermore the solution does not lend itself well to use with per se efficient closed profiles such as for instance box girders. In addition the profile with variable height is suitable only for use along the stairway for which it is designed so that, in the case of a move or a conversion, a large part of the lift installation has to be replaced. Finally, possible deviations in the track of the guide means can only be corrected with considerable effort, wherein the corrections cannot be carried out in situ.

Also known are stair lift installations, such as for instance the installation made commercially available by applicant under the name "Ergolift", wherein the guide means are formed by a for instance tubular standard profile on which is arranged a separate strip for maintaining the position of the load carrier, in this case a chair. In this installation the frame has a sensor which moves along the levelling strip and converts the path of this strip via a rod mechanism into a movement of the chair relative to the frame in order to hold the seat surface of the chair level. A drawback to such installations, however, is that each levelling strip is specifically suited to a particular staircase and must already be arranged during manufacture. Adjustments or corrections of the path of the strip require great effort and can only be carried out in a workshop, so that the installation must be entirely disassembled should this prove necessary. The levelling strip moreover forms an unattractive and troublesome obstacle.

The invention has for its object to provide the stair lift installation of the above discussed type wherein these problems do not arise. This is achieved according to the invention in that the levelling means connect the frame to the load carrier and are formed by a control member carrying information about the position and connected to the drive means, and a follower member to be controlled therewith, wherein the control member and the follower member are movable relative to each other.

Embodiments of the stair lift installation according to the invention which can be advantageously applied are described in the dependent claims 2-4.

The invention is now described on the basis of an embodiment wherein reference is made to the annexed drawing, in which:

fig. 1 shows a perspective view of a part of a stair lift installation according to the present invention,

fig. 2 is a cut away perspective detail view of the frame and the levelling means of the stair lift installation shown in fig. 1,

fig. 3 is a schematic perspective view of a staircase with a number of bends and, arranged therealong, guide means of the stair lift installation according to the invention, and

fig. 4 shows a top view of a disc-like control member which has a control groove and forms part of the levelling means.

A stair lift installation 1 (fig. 1) comprises guide means in the form of a guide beam 2 running substantially parallel to a staircase (not shown), a frame 3 displaceable along the box girder 2 and a load carrier 4 in the form of a chair 5 with footrest 6 suspended pivotally on the frame 3. The stair lift installation 1 further has drive means 7 (not shown) connected to the frame 3 for displacing thereof along the box girder 2 and means 8 (not shown) for maintaining the load carrier 4 in a fixed position relative to the horizontal. These levelling means 8 ensure that the seat surface of chair 5 remains substantially horizontal.

Displacement of the frame 3 along the guide means 2 is effected by the drive means 7 which are formed by an electric motor 9 (fig. 2) which is accommodated in frame 3 and the output shaft 10 of which is connected over a worm wheel transmission 11 to a secondary shaft 12. The latter has a first toothed gear 13 which engages in a gear rack 14 fixed to the guide beam 2, whereby frame 3 can be displaced along the guide means 2. The movement of frame 3 along box girder 2 is guided by a number of guide wheels 15 which are mounted for free rotation on the frame and which engage onto different sides of the guide beam 2.

The levelling means 8 are formed by a control member 16 which is arranged movably on the frame 3 and which carries information about the desired position of load carrier 4 and which controls a follower member 17 fixed to load carrier 4. In the embodiment shown the control member 16 takes the form of a rotatable disc into which is recessed a control groove 18, the path of which represents the information relating to the desired position of load carrier 4 relative to the horizontal. Follower member 17 is formed by a peg, one outer end of which is received in the control groove 18 and the other end of which is arranged on an arm 19 supporting the load carrier 4 and mounted pivotally in the frame 3.

The control member 16, normally designated a "curve disc", is fixed to a tertiary shaft 20 which is driven over a second worm wheel transmission 21 by the secondary shaft 12. When the frame 3 is displaced along the guide means 2 by means of the drive means 7, the curve disc 16 is therefore rotated at the same time. The follower member 17 received in the control groove or curve 18 is thereby moved in the plane of curve disc 16 alternately toward and away from the tertiary shaft 20 in accordance with the path of the control groove 18. This movement of the follower member 17 causes a pivoting of the pivot arm 19 carrying the follower member 17, whereby the position of load carrier 4 is varied in relation to the frame 3.

Because the follower member 17 protrudes only a little below the pivot axis 22 of the load carrier 4, small displacements of follower member 17 in the plane of the curve disc 16 are sufficient to realize considerable angular displacements of load carrier 4. It is hereby possible to suffice with a small curve disc 16, thus obtaining a compact installation.

As control member, a slidable rack fitted with a control profile, a drum rotatable on a horizontal shaft and having a control strip running in peripheral direction or the like could for instance be used instead of the illustrated disc 16 rotatable on a vertical shaft 20.

The control member could, instead of being driven by the lift motor 9, also be driven by a separate motor. The motor of the control member and the lift motor 9 would then have to be mutually connected such that the movement of the control member would proceed synchronously with the displacement of frame 3.

The path of the control groove 18 is chosen such that the movement of the load carrier 4 relative to frame 3 precisely compensates for the movement of frame 3 relative to the horizontal (as a result of the varying inclination of guide beam 2), so that the position of load carrier 4 does not change relative to the horizontal. The desired path of control groove 18 is thus calculated on the basis of the inclination of the guide beam 2, wherein the inclination is translated in each case into a determined distance D (fig. 4) of the groove 18 to the shaft 20 of disc 16. At those locations A,B,C (fig. 3) where the inclination of the guide means 2 changes, this distance D also changes (fig. 4).

The length of the groove 18 and the transmission ratio of the worm wheel transmission 21 (fig. 2) are chosen such that the follower member 17 runs precisely through the groove 18 in the number of revolutions of the secondary shaft 12 that is required to displace frame 3 over the whole length of guide means 2.

In addition to carrying information about the desired position of load carrier 4 relative to frame 3, the control member 16 can otherwise carry other information related to the change in the angle of inclination of guide beam 2. For instance, in the case the frame 3 is arranged on guide beam 2 by means of a so-called three-point suspension and therefore has three guide wheels, whereof two run on the top side and one on the underside along the guide beam 2, at those locations where the guide beam 2 has a curvature the vertical distance between the upper and lower guide means 15 can be adapted to this curvature. To this end at least one of the guide wheels 15 must be arranged for vertical movement on frame 3 and be connected to the control member 16. The latter can then be formed by for instance a curve disc which, in addition to a control groove 18, has a profiled peripheral edge along which runs a second follower member connected to the movable guide wheel 15.

In order to adapt the lift installation to a different track of the stairway or to make corrections, it is not necessary in the case of the installation according to the present invention to disassemble and transport the whole installation to a workshop, it is only necessary to exchange the curve disc.

Claims

1. Stair lift installation (1) provided with guide means (2) running substantially parallel to a stairway, a frame (3) displaceable along the guide means (3), a load carrier (4) suspended pivotally on the frame (3), means (7) connected to the frame (3) for driving thereof and levelling means (8) for holding the load carrier (4) in a substantially fixed position relative to the horizontal, **characterized in that** the levelling means (8) connect the frame (3) to the load carrier (4) and are formed by a control member (16) carrying information about the position and connected to the drive means (7), and a follower member (17) to be controlled thereby, wherein the control member (16) and

the follower member (17) are movable relative to each other.

2. Stair lift installation (1) as claimed in claim 1, **characterized in that** the control member (16) is arranged movably on the frame (3) and the follower member (17) is fixed to the load carrier (4).

3. Stair lift installation (1) as claimed in claim 2, **characterized in that** the control member (16) is a rotatable disc having a control groove (18) in which the follower member (17) is received and the position information is formed by the path of the control groove (18).

4. Stair lift installation (1) as claimed in claim 2 or 3, **characterized in that** the control member (16) is driven over a transmission (21) by the drive means (7).

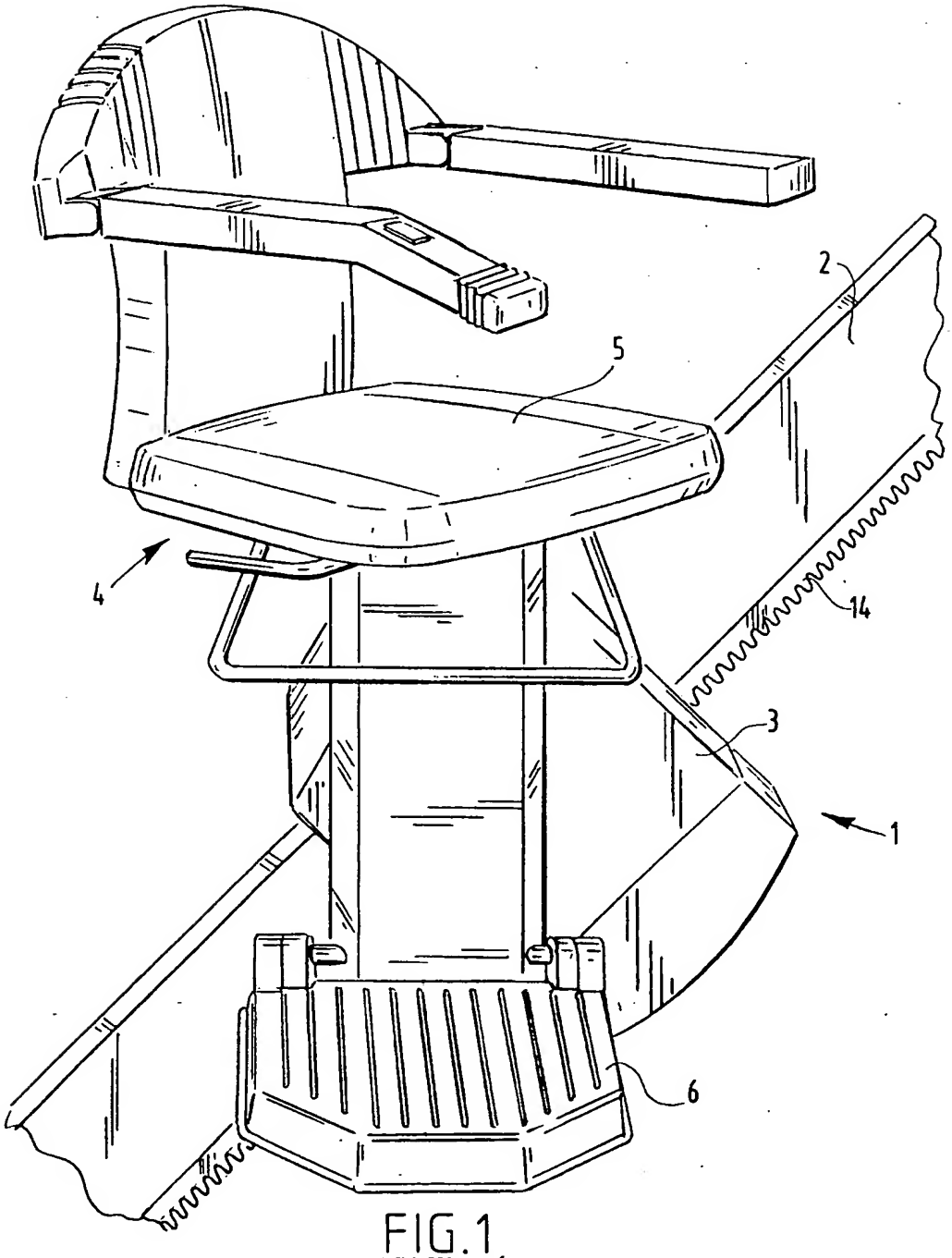

FIG.1

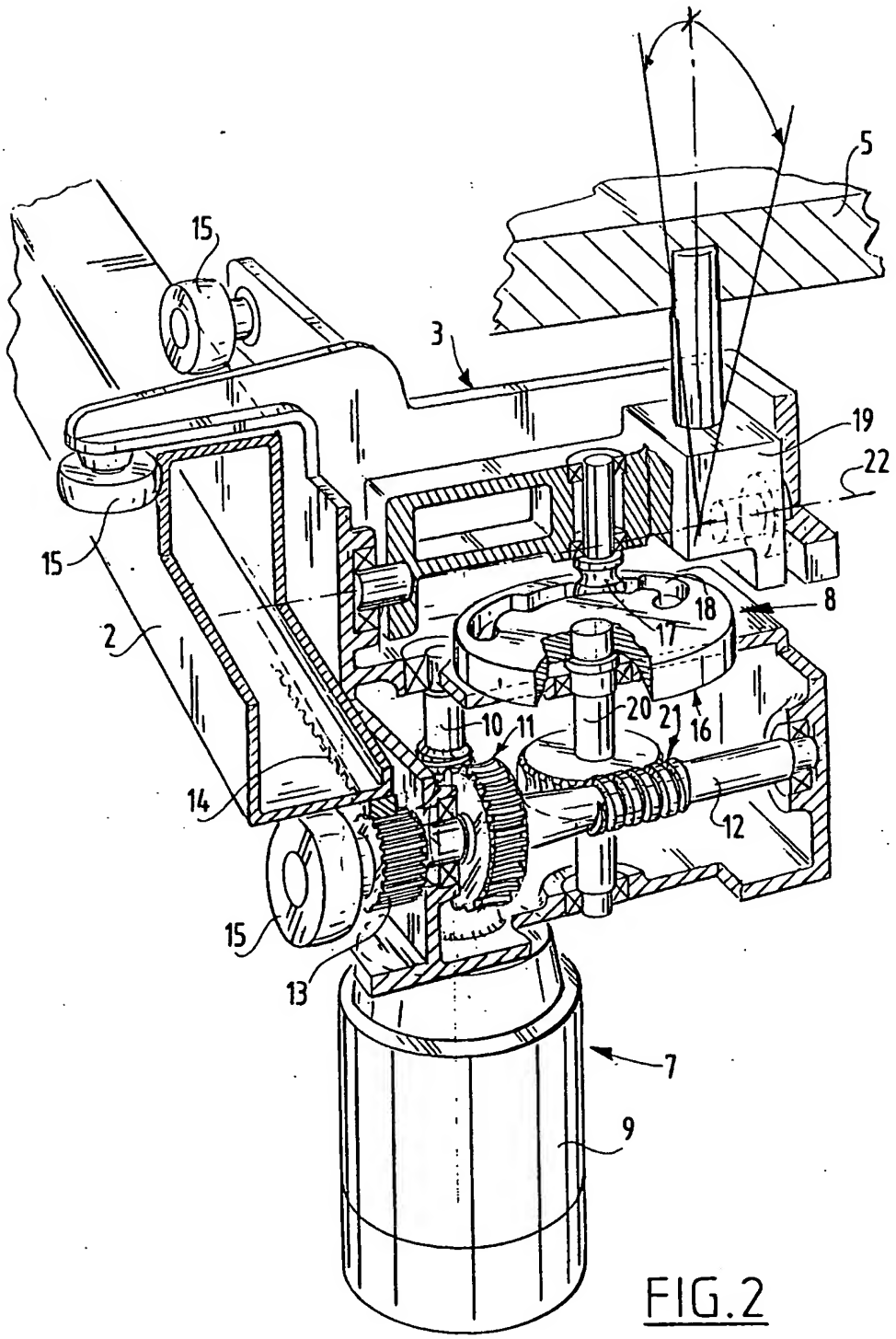

FIG.2

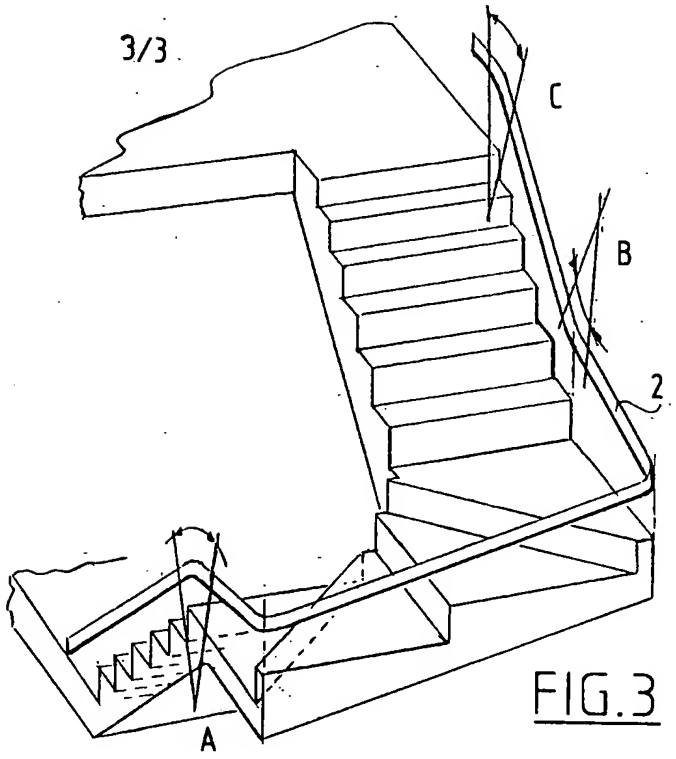

FIG.3

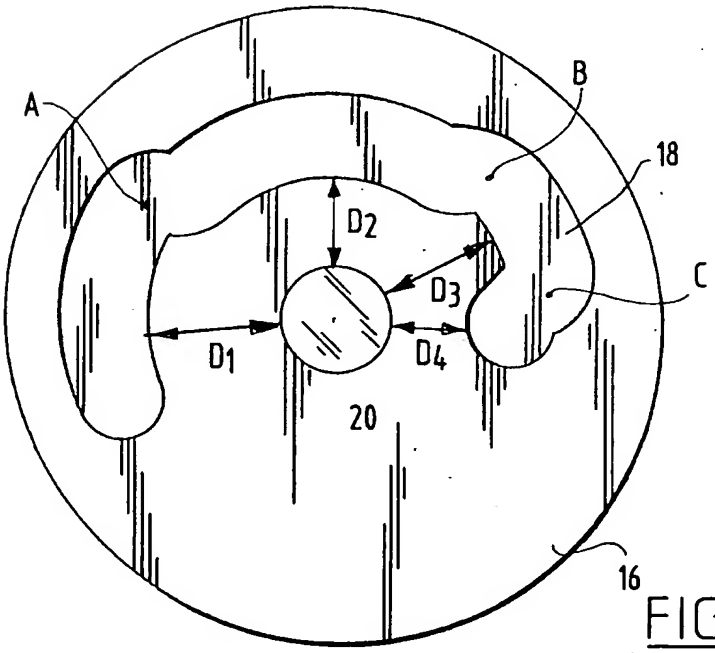

FIG.4

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EUROPEAN SEARCH REPORT

Application Number
EP 93 20 0606

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0 137 577 (ANTONY STOPHER) * page 12, line 1 - line 27 * * page 17, line 16 - page 19, line 4; figures 6-9,17-23 *	1	B66B9/08
A	DE-A-3 210 904 (PAUL NITZKE GMBH & CO KG) * page 8, line 11 - page 10, line 6; figures 1,2 *	1	
A	GB-A-778 091 (THE SHEPARD ELEVATOR COMPANY) * page 4, line 7 - line 84; figures 1-6 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B66B
A61G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 MAY 1993	CLEARY F.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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